CLAIMS

The invention is claimed as follows:

1. A sensor for sensing ammonia in a fluid, comprising:

a fluid flow path having an optical window;

a membrane positioned within the fluid flow path, the membrane exhibiting a color indicative of the concentration of the ammonia in the fluid; and

an optical reader positioned outside of the fluid flow path that can identify the color of the membrane through the optical window.

2. The sensor of claim 1, wherein the membrane is a hydrophobic membrane.

3. The sensor of claim 1, further comprising a fluid pH conditioner in the fluid flow path.

4. The sensor of claim 1, further comprising a fluid parameter sensor having an output signal provided to a processor, the processor utilizing the output signal of the fluid parameter sensor to determine the ammonia concentration.

5. The sensor of claim 4, wherein the parameter sensor senses a parameter selected from the group consisting of a temperature, pH, and combinations thereof.

6. The sensor of claim 1, wherein the fluid flow path is a portion of a dialysis system flow path.

7. The sensor of claim 1, wherein the optical window comprises a flexible sheeting.

8. The sensor of claim 1, wherein the optical reader further comprises:

an infrared emitter connected to a processor;

a first color emitter connected to the processor;

a second color emitter connected to the processor; and

a photo-detector connected to the processor.

9. The sensor of claim 1, further comprising a processor which determines a total ammonia and ammonium concentration of the fluid.

10. A sensor for a dialysis system, comprising:

a fluid container for containing a dialysate fluid;

a membrane positioned inside of the fluid container and having a variable optical property; and

an optical reader positioned outside of the fluid container in a sensing relationship with the membrane.

11. The sensor of claim 10, wherein the fluid container is a disposable unit for use in a single dialysis therapy treatment.

12. The sensor of claim 10, wherein the membrane is a hydrophobic membrane.

13. The sensor of claim 10, wherein the membrane is a colorimetric ammonia sensitive membrane.

14. The sensor of claim 10, wherein the optical reader is a colorimetric reader.

15. The sensor of claim 10, further comprising a fluid pH adjustor upstream of the membrane.

16. The sensor of claim 10, further comprising a fluid temperature sensor at the fluid container.

17. The sensor of claim 10, further comprising a processor connected to the optical reader, the processor having an output indicative of a fluid parameter sensed by the sensor.

18. The sensor of claim 17, wherein the output of the processor is indicative of one of ammonia in the fluid flow path, ammonium in the fluid flow path, total ammonia and ammonium in the fluid flow path, and combinations thereof.

19. A sensor for sensing concentrations of a component of a fluid of a dialysis system in which at least a portion of a fluid flow path of the dialysis system is closed to surrounding environment, the sensor comprising:

an optical indicator positioned within the closed fluid flow path and in direct contact with the fluid when the optical indicator is in use, the optical indicator having a variable optical characteristic of the concentration of the component when the optical indicator is in direct contact with the fluid; and

an optical reader located outside of the closed fluid flow path and so positioned and arranged to detect the optical characteristic of the optical indicator, the optical reader generating an output signal indicative of the optical characteristic of the optical indicator.

20. The sensor of claim 19, further comprising a fluid conditioner at one of either upstream of the optical indicator and within the optical indicator.

21. The sensor of claim 20, wherein the fluid conditioner is a pH adjustor.

22. The sensor of claim 19, wherein the variable optical characteristic comprises variable colors.

23. The sensor of claim 19, wherein the optical sensor comprises an ammonia sensing membrane.

24. The sensor of claim 19, wherein the optical reader is a colorimetric sensor.

25. The sensor of claim 19, further comprising a processor which receives the output signal of the optical reader and determines an ammonia concentration based at least in part on the output signal of the optical reader.

26. The sensor of claim 25, further comprising a fluid parameter sensor having an output signal provided to the processor, the processor utilizing the output signal of the fluid parameter sensor in the determination of the ammonia concentration.

27. The sensor of claim 26, wherein the parameter sensor is selected from the group consisting of a temperature sensor, a pH sensor, and combinations thereof.

28. An ammonia sensor for a dialysis system, comprising:

a disposable unit having a fluid flow path;

a ammonia sensitive membrane inside of the fluid flow path; and

a membrane reader positioned outside of the fluid flow path in sensing relationship with the membrane.

29. The ammonia sensor of claim 28, wherein the membrane is a colorimetric ammonia sensitive hydrophobic membrane.

30. The ammonia sensor of claim 28, wherein the membrane reader is a colorimetric reader.

31. A method of sensing ammonia in a dialysis system, comprising the steps of:

providing an ammonia sensitive device inside of a fluid flow path having a fluid inlet and a fluid outlet;

flowing dialysate through the fluid flow path;

allowing the ammonia sensitive device to contact dialysate located in the fluid flow path;

causing a color of a portion of the ammonia sensitive device to change in response to a concentration of ammonia in the dialysate; and

identifying the color of the ammonia sensitive device from outside of the fluid flow path.

32. The method of claim 31, further comprising the step of determining a total ammonia and ammonium concentration of the dialysate is based at least in part on the color of the ammonia sensitive device.

33. The method of claim 31, wherein the step of providing an ammonia sensitive device further comprises the step of providing a hydrophobic ammonia sensitive membrane inside of the fluid flow path.

34. The method of claim 31, further comprising the step of adjusting a pH of the dialysate upstream of the ammonia sensitive device.

35. The method of claim 32, further comprising the step of adjusting a pH of the dialysate upstream of the ammonia sensitive device, and wherein the determining step further comprises the step of determining the total ammonia and ammonium concentration of the dialysate based at least in part on the adjusted pH.

36. The method of claim 35, further comprising the step of measuring a temperature of the dialysate, and wherein the determining step further comprises the

step of determining the total ammonia and ammonium concentration of the dialysate based at least in part on the measured temperature.

37. The method of claim 32, further comprising the step of measuring a pH of the dialysate, and wherein the determining step further comprises the step of determining the total ammonia and ammonium concentration of the dialysate based at least in part on the measured pH.

38. The method of claim 37, further comprising the step of measuring a temperature of the dialysate, and wherein the determining step further comprises the step of determining the total ammonia and ammonium concentration of the dialysate based at least in part on the measured temperature.

39. A method of performing dialysis, comprising the steps of:

removing waste from a patient using dialysate fluid;

positioning in the dialysate fluid a membrane that changes a parameter in relation to the level of a component in the dialysate fluid; and

identifying the change in the parameter of the membrane.

40. The method of performing dialysis of claim 39, wherein the positioning step further comprises contacting an ammonia sensitive membrane with the dialysate fluid.

41. The method of claim 39, further comprising changing an optical parameter of the membrane.

42. The method of claim 39, wherein the identifying step further comprises sensing a color of the membrane.

43. The method of claim 39, further comprising the step of treating the dialysate fluid prior to the step contacting the membrane with the dialysate fluid.

44. The method of claim 43, wherein the treating step further comprises adjusting a pH of the dialysate fluid.

45. The method of claim 39, wherein the step of removing waste further comprises performing peritoneal dialysis.

46. The method of claim 39, wherein the step of removing waste further comprises performing hemodialysis.

47. The method of Claim 39, wherein the component is ammonia.

48. The method of Claim 39, wherein the component is ammonium.

49. A method of performing dialysis, comprising the steps of:

removing waste from a patient using dialysate fluid and thereby forming spent dialysate;

positioning in the spent dialysate an ammonia sensitive member which has a characteristic that changes in relation to the level of ammonia in the spent dialysate; and

identifying a change in the characteristic of the ammonia sensitive member.

50. The method of performing dialysis of claim 49, wherein the ammonia sensitive member is a membrane.

51. The method of claim 49, wherein the characteristic of the member is color.

52. The method of claim 49, wherein the step of removing waste further comprises performing peritoneal dialysis.

53. The method of claim 49, wherein the step of removing waste further comprises performing hemodialysis.